Major Wheat Diseases

Septoria Glume Blotch

Glume blotch is caused by the fungus ***Septoria nodorum*** and has caused an average annual loss of approximately 20% in yield over the last five years. There is an upsurge in damage from this disease in Tennessee and surrounding states because of the increased acreage and disease build-up. Rainy weather after heading can increase disease severity and cause major yield loss.

Small yellowish to brown lesions begin on lower leaves in the early spring especially those contacting the soil. Lesions are water-soaked briefly then become dry, yellow and finally, red-brown. Some develop gray-brown or ash colored centers. The upper leaves, necks and glumes become infected as heads begin to develop. These infections cause the most severe damage. Infection is greatest between 20-27°C (59-80/F) when wet or humid conditions prevail.

Rotation, balanced fertility, destruction of old crop residue, resistant varieties and foliar fungicides help to reduce the yield loss of this destructive disease.

Septoria Leaf Blotch

Septoria leaf blotch is caused by ***Septoria tritici***. This leaf disease is similar to glume blotch except the irregular lesions are restricted laterally and assume parallel sides. The lesions caused by Septoria nodorum (glume blotch) are more lens-shaped. This disease can be severe especially when whole leaves are killed. Leaf blotch is favored by slightly cooler temperatures of 15-20/C (59-68/F) and wet, windy conditions. Dry, hot weather will halt the development of this disease. Leaf blotch and glume blotch frequently occur at the same time in the field in Tennessee.

The same control measures apply for leaf blotch as for glume blotch. Recommended foliar fungicides are very effective in controlling this disease if applied before leaf damage occurs.

Septoria Leaf Spot

Septoria leaf spot is caused by ***Septoria tritici***. This fungus has caused severe losses in the last few years. Leaf symptoms are similar to those caused by ***S. nodorum***. Lesions of ***S. tritici*** tend to be restricted laterally and assume parallel sides. Those of ***S. nodorum*** are more lens-shaped. The main difference between the two fungi is that ***S. tritici*** does not infect the glumes as ***S. nodorum***. ***S. tritici*** causes more damage during wet conditions and temperatures of 15-20/C (59-68/F). ***S. nodorum*** epidemics occur when temperatures range 20-27/C (68-81/F) and wet conditions prevail. Of course in nature both species are present and cause damage in Tennessee.

Leaf Rust

Leaf Rust caused by the fungus ***Puccinia recondita*** f. sp. ***tritici*** is widely distributed in wheat growing regions. Leaf rust causes small reddish orange pustules (infection spots) on the upper side of wheat plants. Damage to wheat depends on its stage of growth relative to rust development. Epidemics that occur before or during flowering are most detrimental. Overall, leaf rust reduces plant vigor, seed filling and root growth. This disease develops rapidly in the spring between 15 and 22°C (59°-72°F) when moisture is not limiting. Leaf rust is sometimes synergistically (more damage than the sum of both) damaging in combination with glume blotch. Resistant varieties are the best means of control, however, the fungus has the ability to change quickly. Varieties that once were resistant can become quickly susceptible. Some fungicides have been found to be very effective in controlling this disease.

Powdery Mildew

Powdery mildew is caused by the fungus ***Erysiphe graminis*** f. sp. ***tritici***. This fungus infects all aerial portions of the plant, but it is usually most prevalent on the upper surface of lower leaves. Colonies of initially white fungus infect the lower leaves and stems early in the spring. infection continues upward as the plant grows when temperatures are cool 15-22°C (59-72°F) and moisture is available. It is markedly retarded above 25°C (77°F). Dense stands of susceptible varieties, heavy nitrogen fertilization and humid cool conditions favor disease development. Resistant varieties are perhaps the best defense against powdery mildew although some fungicides are very effective in controlling it.

Foliar Fungicides

Foliar fungicides have proven to be effective and economical when properly applied. The table below shows an average of all research conducted on mancozeb 80WP (Dithane M-45 or Manzate 200) for the past five years.

Glume Blotch is still the most consistent disease in its ability to reduce yields year after year. Leaf Rust and Powdery Mildew cause damage in certain years when conditions are favorable.

Wheat Disease Control With Recommended
Foliar Fungicides
Average, 1990-93

TREATMENT*	4 YR.AVER. BU/ACRE	INCREASE BU/ACRE**	FUNGICIDE COST/ACRE	APPLICATION COST/ACRE	NET PROFIT PER ACRE
No Treatment	51	--	--	--	--
Tilt	66	15	10.00	3.00 (one)	34.25
Mancozeb + Bayleton	64	13	13.00	3.00 (one)	24.95
Tilt f.b. + Mancozeb	69	18	16.00	6.00 (two)	37.70
Dithane + Bay f.b. Mancozeb	70	19	19.00	6.00 (two)	34.85

Research conducted by Albert Y. Chambers at the West Tennessee Experiment Station.
Wheat was priced at $3.15/bushel for net profit calculations

* Tilt 3.6 EC at 4.0 oz./Acre. Mancozeb = Dithane 75% DF at 2 lbs./Acre. Bayleton 50% DF at 2.0 ozs./Acre
** 1st application made at F8 growth stage (flag leaf just visable), 2nd application made 2-3 weeks after the first (Heading - F10.1)
f.b. = followed by

Selecting Fields To Be Sprayed

Wheat producers should be selective when considering using a foliar fungicide. Wheat yields and diseases differ from field to field and from farm to farm. Many times aids such as the point system can be used to help determine the practicality of spraying. However, this is not a guarantee that an economic increase will occur. The use of a properly applied foliar fungicide in a wet year when production is at a maximum can increase yields from 5-15 bushels per acre. However, if the weather suddenly turns dry, disease development will be stopped and very little increase in yields may be noted.

WHEAT FOLIAR FUNGICIDE POINT SYSTEM

THIS POINT SYSTEM SHOULD BE USED ONLY AS A GUIDE TO DETERMINE THE NEED FOR APPLICATION OF FOLIAR FUNGICIDES. IT DOES NOT GUARANTEE AN ECONOMICAL RETURN. IF A ZERO IS INDICATED IN ANY MAJOR (I-VIII) CATEGORY, THEN THE FIELD SHOULD NOT BE SPRAYED.

FACTORS (PICK ONLY ONE IN EACH CATEGORY)		POINTS
I. YIELD POTENTIAL (5-7 DAYS BEFORE FIRST SPRAY)		
1. 40 BU./A. OR ABOVE	150	
2. 30-39 BU./A.	50	
3. BELOW 30 BU./A.	0	I.____
II. CROPPING HISTORY		
1. WHEAT IN FIELD LAST YEAR	100	
2. WHEAT IN FIELD TWO YEARS AGO	50	
3. FIRST TIME IN WHEAT THREE YEARS OR LONGER	25	II.____
III. FERTILITY (TOTAL NITROGEN)		
1. APPLIED 90-120 LBS. OF NITROGEN/A.	100	
2. APPLIED ONLY 60-90 LBS. OF NITROGEN/A.	50	
3. APPLIED NO NITROGEN	0	III.____
IV. SEEDLING RATE (ASSUMING 80% PLUS GERMINATION)		
1. PLANTED 2 OR MORE BU./A.	75	
2. PLANTED 1.5-2.0 BU./A.	50	
3. PLANTED LESS THAN 1.5 BU./A.	25	IV.____
V. DISEASE AT FIRST APPLICATION (STAGE 10, BOOT STAGE).		
1. SEVERE (DISEASES STARTING ON FLAG LEAF)	100	
2. MODERATE (BOTTOM & MIDDLE LEAVES DISEASES)	75	
3. LIGHT (DISEASES FOUND ON LOWER LEAVES)	50	
4. NOT PRESENT	25	V.____
VI. SEASONAL RAINFALL PRIOR TO FIRST APPLICATION		
1. ABOVE NORMAL	100	
2. NORMAL	75	
3. BELOW NORMAL	25	VI.____
VII. TRADITIONAL DISEASE PRESSURE		
1. HEAVY	125	
2. MODERATE	75	
3. LIGHT	25	VII.____

VIII. DISEASE RESISTANCE OF VARIETY GROWN.
*(SEE TABLE 1 FOR VARIETY RATINGS.)
ENTER A VALUE FOR EACH DISEASE

DISEASES	(DISEASE RATING FROM NEXT PAGE) HIGH	MOD.	LOW		
1. LEAF RUST	0	50	100	1.___	
2. GLUME BLOTCH	0	100	200	2.___	
3. POWDERY MILDEW	0	50	100	3.___	VIII.___
TOTAL POINTS___					

AFTER INSPECTION OF EACH FIELD (5-7 DAYS BEFORE BOOT STAGE), PRODUCERS SHOULD TOTAL THE NUMBER OF POINTS TO DETERMINE THE PROBABILITY OF AN ECONOMICAL RETURN. (CONTINUED NEXT PAGE)

TOTAL FIELD POINTS	CHANCES OF ECONOMICAL RETURN
750-1000	EXCELLENT
500-749	FAIR
BELOW 500	POOR (DO NOT SPRAY)

DISEASE RESISTANCE RATING OF RECOMMENDED WHEAT VARIETIES

				**YIELD/BU./A.	
VARIETIES	LEAF RUST	GLUME BLOTCH	POWDERY MILDEW	NO FUNGICIDE	WITH FUNGICIDE
CARDINAL	MOD.	MOD.	MOD.	45	52
COKER 9803	HIGH	MOD.	HIGH	60	62
FFR 350	LOW	MOD.	HIGH	43	50
FFR 525	LOW	MOD.	LOW	48	54
FFR 555	LOW	HIGH	HIGH	51	54
GORE	HIGH	MOD.	HIGH	61	61
HICKORY	MOD.	MOD.	HIGH	58	63
JACKSON	LOW	HIGH	HIGH	53	69
MADISON	LOW	MOD.	HIGH	50	57
MALLARD	HIGH	MOD.	MOD.	54	57
N.K. COKER 9543	MOD.	MOD.	HIGH	56	59
PIONEER 2580	LOW	MOD.	HIGH	60	70
PIONEER 2684	MOD	HIGH	HIGH	57	61
SAWYER	LOW	MOD.	HIGH	56	62
TERRAL 101	HIGH	MOD.	MOD.	55	58
VERNE	MOD.	MOD.	HIGH	47	52
WAKEFIELD	LOW	MOD.	MOD.	43	56

RATING: (DISEASE RATINGS MAY CHANGE FROM YEAR TO YEAR)
LOW RESISTANCE IS LOW AND IS VERY SUSCEPTIBLE TO THE DISEASE.
MOD. MODERATE RESISTANCE. THE VARIETY HAS SOME TOLERANCE BUT MAY BE DAMAGED UNDE
HIGH HIGH RESISTANCE.
DISEASE PRESSURE.

A LOW RATING FOR LEAF RUST,
MANCOZEB 80 WP.
TILT 3
FOR OTHER RESTRICTIONS)

*DISEASE RATINGS WERE MADE AT MILAN AND JACKSON EXPERIMENT STATIONS DURING 1994 AN
**Yields at West Tennessee Experiment Station with and without one application of a foliar fung

Stage of Growth to Apply Foliar Fungicides

Close attention must be paid to the stage of growth to obtain maximum benefit from foliar fungicides. If the first application is made too late, then infection could have already occurred. Proper control is difficult after infection is underway.

First application - Apply 2 lbs. mancozeb when head is in boot (stage 10).
Second application - Apply 2 lbs. mancozeb about two weeks after first application when heads are fully emerged (stage 10.5).

Tilt may be applied only one time no later than stage 8 (before heading).

Bayleton may be tank mixed with mancozeb for added rust and mildew control.

Each application must be made in at least **5 gals. of water** per acre by airplane or at least 20 gals. of water per acre with ground rigs. Always use a good **spreader-binder** that is labelled for fungicides with either application method.

Recommended Foliar Fungicides

Chemical Name	**Trade Name & Company**	**Formulation**	**Rate/A. per Application**	**Primary Diseases Controlled**
Mancozeb	Dithane (Rohm & Haas)	80% WP 75% DF	2 lbs. 2 lbs.	Glume Blotch and Leaf Blotch
Mancozeb	Manzate 200 (Dupont)	80% WP 75% DF	2 lbs. 2 lbs.	Glume Blotch and Leaf Blotch
Mancozeb	Pencozeb (Elf Atochem)	80% WP 75% DF	2 lbs. 2 lbs.	Glume Blotch and Leaf Blotch
Triadimefon*	Bayleton (Mobay)	50% WP 50% DF	2 - 4 oz.	Rust, Powdery Mildew
Propiconazole	Tilt 3.6EC (Ciba)	(41.8%) EC	4 oz.	Rust, Glume Blotch, Leaf Blotch

*Bayleton should be tank mixed with recommended rates of mancozeb when leaf rust and/or powdery mildew threaten to cause damage to the flag leaf of the wheat plant. This product is very effective on rust and mildew but is weak on glume blotch. Mancozeb gives some control of rust and mildew but is not adequate when these diseases are severe.

BARLEY YELLOW DWARF

Barley Yellow Dwarf (BYD) is the most wide-spread and destructive virus disease in Tennessee and throughout many parts of the world. BYD causes the most damage when wheat is in the seedling stage of growth. Usually, early planted wheat receives the most yield loss. Damage to wheat can vary with variety, planting date, weather conditions, availability of aphids and time of infection.

Several species of aphids spread the BYD virus. Fall infections are most damaging to the young wheat. BYDV virus is not transmitted through seed, soil, sap or by other insects.

BYD may be difficult to diagnose because symptoms resemble nutritional or other nonparasitic disorders. Reddening or yellowing of older leaves in the seedling stage is common. Wheat plants along with their root systems may be stunted or even killed. Diseased flag leaves in the spring may be various shades of yellow or red.

Fairly good control has been shown in demonstrations and research results with a commercially applied seed treatment of an systemic insecticide called **Gaucho 480F**. Only seed treaters approved by Gustafson may apply this chemical at rates of 1.0 to 3.0 fluid ounces per hundredweight of seed prior to planting as a slurry. Gaucho more consistently increased yields in research plots than granular or foliar applied insecticides. The toxicity and chance of exposure is also less with Gaucho compared to most other approved insecticides for aphid or BYD control.

WHEAT SPINDLE STREAK

A **new virus** disease (**wheat spindle streak**) has infected wheat in the Northern one-half of the state since 1983. This virus seems to be more destructive in cool, wet springs. It has now spread to many parts of the wheat growing area. Variety tests indicate some varieties are very susceptible and some fairly resistant. Producers should consider using varieties which indicate good resistance. No fertilizer or insecticide will reduce the damage from this disease. Research has not been able to find any other control method.

FUNGICIDE SEED TREATMENT FOR WHEAT

There are several reasons producers should use fungicide seed treatments:

1. To increase possibility of a better stand.
2. To reduce seed pathogens, such as smut.
3. To increase survival when planting seed by airplane or other surface planting methods.

RECOMMENDED SEED TREATMENTS

FUNGICIDE	OUNCES/100 LBS. SEED
VITAVAX - PCNB*	3-4
VITAVAX - 200*	3-4
VITAVAX - 75*	2-3
VITAVAX - 34*	2-3

*CONTROLS HEAD SMUT WITH GOOD SEED COVER AND HIGHER RATES.

BASIC WHEAT DISEASE CONTROL PRINCIPLES

1. FOLLOW FERTILITY RECOMMENDATIONS CLOSELY.
2. OBSERVE RECOMMENDED PLANTING DATES AND PLANTING RATES.
3. USE RESISTANT VARIETIES IF AVAILABLE.
4. USE FUNGICIDES FOR FOLIAR DISEASE CONTROL WHEN PRACTICAL.
5. USE SEED TREATMENT FOR INCREASED GERMINATION.
6. USE GAUCHO ON THE SEED WHEN BYD IS A THREAT.

Wheat Diseases

Disease	Cause	Symptoms	Control
Leaf Rust	Puccinia recondita f. sp. tritici	Leaf rust is sometimes a serious problem in Tennessee. First signs are reddish-orange spore masses (pustules) that erupt through leaf surfaces under warm, humid conditions, spread is rapid and leaves turn dull yellow with rust. Losses can be heavy, esp. if drought conditions occur.	Plant locally recommended varieties with resistance to leaf rust. Maneb 80% WP applied for Glume Blotch has some effect on leaf rust. Other fungicides such as Bayleton 50% WP may be used effectively.
Septoria Leaf and Glume Blotch	Septoria spp.	First symptoms appear as small, oval, purplish brown spots on lower leaves. These enlarge into elongate, light brown blotches, leaves become blighted. Dark, purplish black spots develop on glumes. Kernels often become shriveled and test weight may be reduced.	Practice crop rotation. Treat seed with recommended fungicides. Plant recommended varieties and fertilize according to soil tests. Use 2 sprays of mancozeb 80% WP, 2 lbs./A. per application, starting just before heading and again just after heading. (Be sure to use point system.)
Take-All	Gaeumannomyces graminis var. tritici	Take-all is most obvious near heading on plants growing in moist soil. Diseased crops appear uneven in height and irregular in maturity. Diseased plants easily break free at their crown when pulled from the soil. Infected plants are stunted, mildly chlorotic, have few tillers and ripen prematurely. Their heads are often bleached (white-heads) and sterile. Roots are sparse, blackened and brittle from fungus invasion. A black-brown, dry rot extends to the crown and basal stem, where a dark skinny fungus plate is diagnostic just beneath the lowest leaf path.	Practice crop rotation. Lime and fertilize according to soil tests for wheat. Use recommended seed treatments.
Barley Yellow Dwarf (BYD)	Barley Yellow Dwarf Virus (BYDV)	Symptoms caused by BYDV are ambiguous and often overlooked or associated with nutritional or non-parasitic disorders. BYD is diagnosed by the presence of aphid vectors and occurrence of yellowed, stunted plants, singly or in small groups. Seedling infections slow plant growth and cause prominent or yellowing of old leaves. Yellowed or reddened flag leaves on otherwise normal plants are indicative of pest seedling infections. Diseased plants have less flexible leaves and underdeveloped root systems. Phloem tissues may be darkened. Cool temperatures (16 - 20 C) enhance symptoms expression.	More than 20 aphid species transmit BYDV. Among them Rhopalosiphum padi L., the oat bird cherry aphid; macrosiphum avenae Fab., the english grain aphid and Schizaphis graminum Rond., the greenbug, are most important. Seedling infections can be offset from periods of high aphid activity by planting in late Fall around Oct. 15. Insecticide applications may not kill aphids before infections occur; but, they may reduce secondary spread and increase yields. (See insect control recommendations.)

Barley Diseases

Disease	Cause	Symptoms	Control
Barley Scald	Rhynchosporium secalis	Water-soaked blotches first appear on leaf blades and sheaths. These later change from bluish-green to brown and finally to a bleached straw color with purple to brown margins. Heavily affected leaves wither and ie prematurely.	Practice crop rotation and treat with recommended fungicide.
Barley Smuts	Ustilago nuda and Ustilago hordei	Smutty heads are blackish and are composed of dry powdery black spores. Spores are blown about where they can infect other health heads and contaminate the grain for next season.	Use recommended seed treatments.
Barley Yellow Dwarf (BYD)	Barley Yellow Dwarf Virus (BYDV)	Same as in wheat.	Same as in wheat.
Basal Glume Rot	Pseudomonas atrofaciens or P. syringae	Darkened or streaked glumes. Dark longitudinal streaks also may occur on upper culm. These can progress laterally and form dark blotches on the neck or immediately above nodes.	This seed and soil borne bacterium may be damaging during wet weather. Clean or chemically disinfected seed will reduce this disease.
Black (Sooty) Head Mold	Cladosporium alternaria stemphylium Epicoccum sporobolmyces	Dark black superficial molds on wheat heads when wheat nears maturity. Plants that are nutritionally deficient, lodged or damaged usually support "sooty" mold. This very mild disease is sometimes mistaken for Glume Blotch.	Follow all recommended production practices. Foliar fungicides such as 2-3 applications of Maneb 80% WP will reduce this disease, but may not be economical.
Head Blight or Scab	Fusarium spp.	Premature death or blighting of spikelets. Bleached spikelets usually are sterile or contain only partially filled seeds.	No highly resistant cultivars are available. Chemical seed treatments are a partial deterrent. Rotate with crops other than cereals and bury crop residues. Application of lime to soil, in some instances reduces disease levels. Foliar fungicides are not effective.
Loose Smut	Ustiliago tritici	Infected heads emerge slightly earlier than normal and have their spikelets entirely transformed into a dry black spore mass. As heads emerge, spores are dispersed by wind. These spores infect healthy plants and smutted heads will result the following year.	Treat wheat seed used for planting with carboxin (Vitavax).
Powdery Mildew	Erysiphe graminis f. sp. tritici	First symptoms are yellowish spots on leaves and sheaths which soon develop grayish white masses of mildew. Heavily infected leaves turn brownish yellow and die. Affected plants may fail to produce heads. Test weight may be reduced.	Plant recommended varieties which have most resistance. When severe, use foliar fungicides.

Disclaimer Statement

Pesticides recommended in this publication were registered for the prescribed uses when printed. Pesticide regulations are continuously reviewed. Should registration or a recommended pesticide be canceled, it would no longer be recommended by The University of Tennessee. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.
Agricultural Extension Service Charles L. Norman, Dean